



PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Kazuo ICHIKAWA et al.

Application No.: 09/670,877

Filed: September 27, 2000

For: CVD SUBSTRATE AND CLEANING METHOD

Group Art Unit: 1763

Examiner: R. Zervigon

Docket No.: 107469

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5/30/02
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REQUEST FOR RECONSIDERATION

Director of the U.S. Patent and Trademark Office
Washington, D.C. 20231

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Sir:

In reply to the Office Action mailed February 26, 2002, reconsideration of the rejection of claims 1-4 is respectfully requested in light of the following remarks.

Claims 1-4 are rejected under 35 U.S.C. §102(b) as allegedly anticipated by Hara et al., US 5,648,276. Applicants respectfully traverse this rejection.

The Office Action cites Hara, which discloses a CVD system provided with a plasma generator having a plasma generation chamber separated from a film deposition chamber in which a substrate is arranged. According to the apparatus of Hara, a material gas is directly supplied into the film deposition chamber, radicals in the plasma are introduced into the film deposition chamber from the plasma generator through a *mesh electrode* and a thin film is deposited on the substrate. A gas feeder is provided to the plasma generator.

The insulating film deposition chamber according to the CVD system of claims 1 and 2, comprises a film deposition chamber and a plasma generator. The plasma generation chamber of the plasma generator is connected to the film deposition chamber only through

holes formed in the lower plate, which only introduce radicals into the film deposition chamber. Thus, the only link between the plasma generation chamber and the film deposition chamber in the apparatus of the claimed invention are the holes formed in the lower plate, which otherwise isolates one chamber from the other chamber.

In contrast, the CVD chamber disclosed by Hara only shows that the film deposition chamber and plasma generation chamber are divided by a mesh electrode (see Fig 3). Hara discloses that the mesh electrode is "supplied with a variable voltage" (see col. 7, lines 17-18). In contrast, the lower plate of the claimed invention is connected to ground (see page 8, lines 16-17). Accordingly, the bottom plate of the claimed invention does not correspond to the mesh electrode of Hara, as asserted in the Office Action. Thus, Hara fails to teach or suggest the structure of the claimed CVD system, as the "mesh electrode" is a significantly different element than the lower plate with radical introduction holes, and Hara fails to disclose such a lower plate, as claimed.

In addition the CVD chamber disclosed by Hara lacks a cleaning gas feeder to the plasma generation chamber. The gas feeder of the cited reference is the feeder for feeding the gas corresponding to the material of the film. That is, the gas fed from the upper side and through the ring member is not the cleaning gas but the gas for film deposition. Therefore, the assertion of the Office Action regarding the gas feeder is incorrect. In contrast, the CVD chamber of the claimed invention incorporates a separate cleaning gas feeder (see, e.g., Fig 2, the second gas feeder 28) in addition to the first gas feeder, which feeds the film deposition gas. For at least these reasons, claims 1 and 2 are patentable over Hara.

The Office Action further asserts that Hara discloses a cleaning method whereby a silicon-based film is deposited on a substrate, converted to a crystalline silicon-based film by laser annealing, whereupon a gate insulating film is then deposited on the crystalline film by

the CVD system as described above. Specifically, the Office Action asserts that plasma "cleaning" is discussed as a step prior to forming the gate insulating film.

However, the cleaning method of instant claims 3 and 4 requires introducing only the radicals of the plasma generated using a cleaning gas. The radicals are introduced into the film deposition chamber to remove impurities from the crystalline surface before the gate insulating film is deposited.

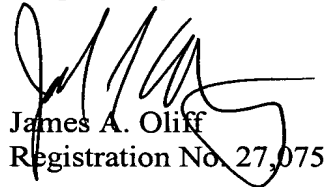
In contrast, Hara entirely fails to teach the claimed substrate cleaning method. The "cleaning" step identified by the Office Action is merely a hydrogenation process, not a process of cleaning the film surface. The hydrogenation described by Hara is a method of introducing an active hydrogen and forming an Si-H bond to terminate any dangling bonds of the silicon in the silicon film. The process does not remove impurities from the surface of the film surface. Therefore, the hydrogenation described in the cited reference is completely different from the cleaning of the substrate surface of the present invention. For at least these reasons, claims 3 and 4 are also patentable over Hara.

Accordingly, Hara does not anticipate the subject matter of any of claims 1-4. Reconsideration and withdrawal of the rejections are respectfully requested.

In view of the foregoing amendments and remarks, Applicants submits that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-4 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in better condition for allowance, the Examiner is invited to contact Applicants' undersigned representative at the telephone number listed below.

Respectfully submitted,



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Date: May 28, 2002

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